techni-rite

MODEL TSC-500

SIGNAL CONDITIONER

for use with

TECHNI-RITE Model TR-888
Eight Channel Recorder

PROPERTY OF
ElectroRent
CALL TOLL FREE (800) 423-2337
CALIFORNIA (800) 232-2173

operations and service manual

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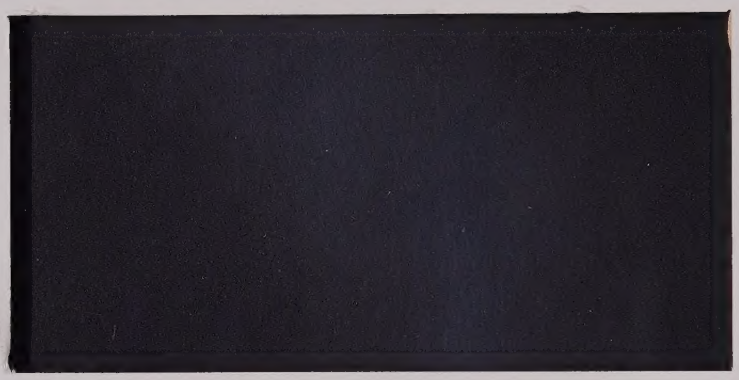
ELECTRONICS
INCORPORATED



L-391

OPERATIONS AND SERVICE MANUAL

MODEL TSC-500

SIGNAL CONDITIONER

for use with

TECHNI-RITE Model TR-888
Eight Channel Recorder

TECHNI-RITE ELECTRONICS, INC.
TECHNI-RITE Industrial Park
East Greenwich, R.I. 02818

WARRANTY

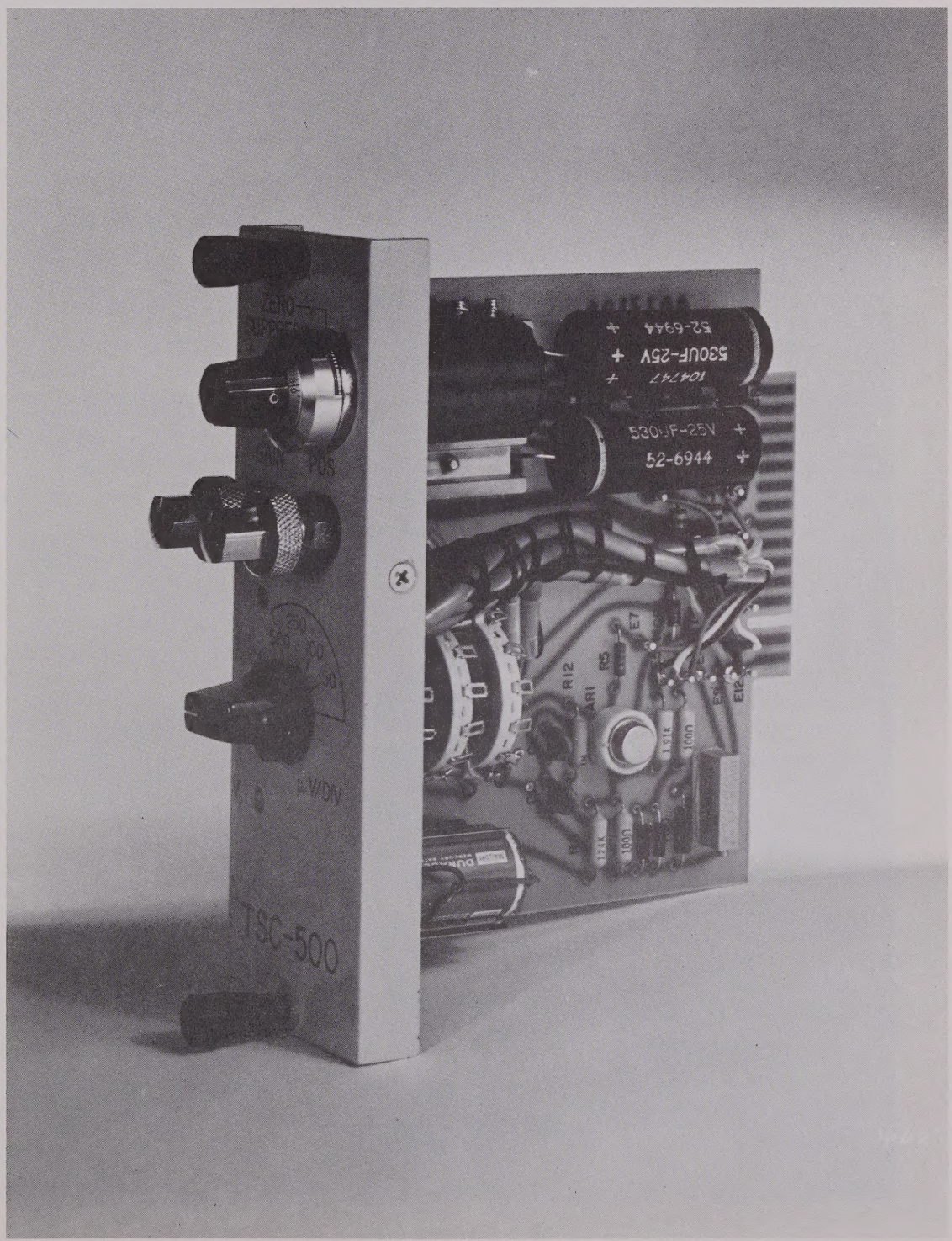
TECHNI-RITE warrants each instrument to be free from defects in material and workmanship. Our liability under this warranty is limited to servicing or adjusting any instrument returned to the factory for that purpose and replacing any defective parts thereof (except pens, tubes, fuses and batteries). This warranty is effective for one year after delivery to the original purchaser, when the instrument is returned transportation charges prepaid by the original purchaser, and which upon our examination proves to be defective. If the fault has been caused by misuse or abnormal conditions of operation, repairs will be billed at our current rate. In this case, an estimate will be submitted before the work is started. This warranty is in lieu of all other warranties, expressed or implied.

TABLE OF CONTENTS

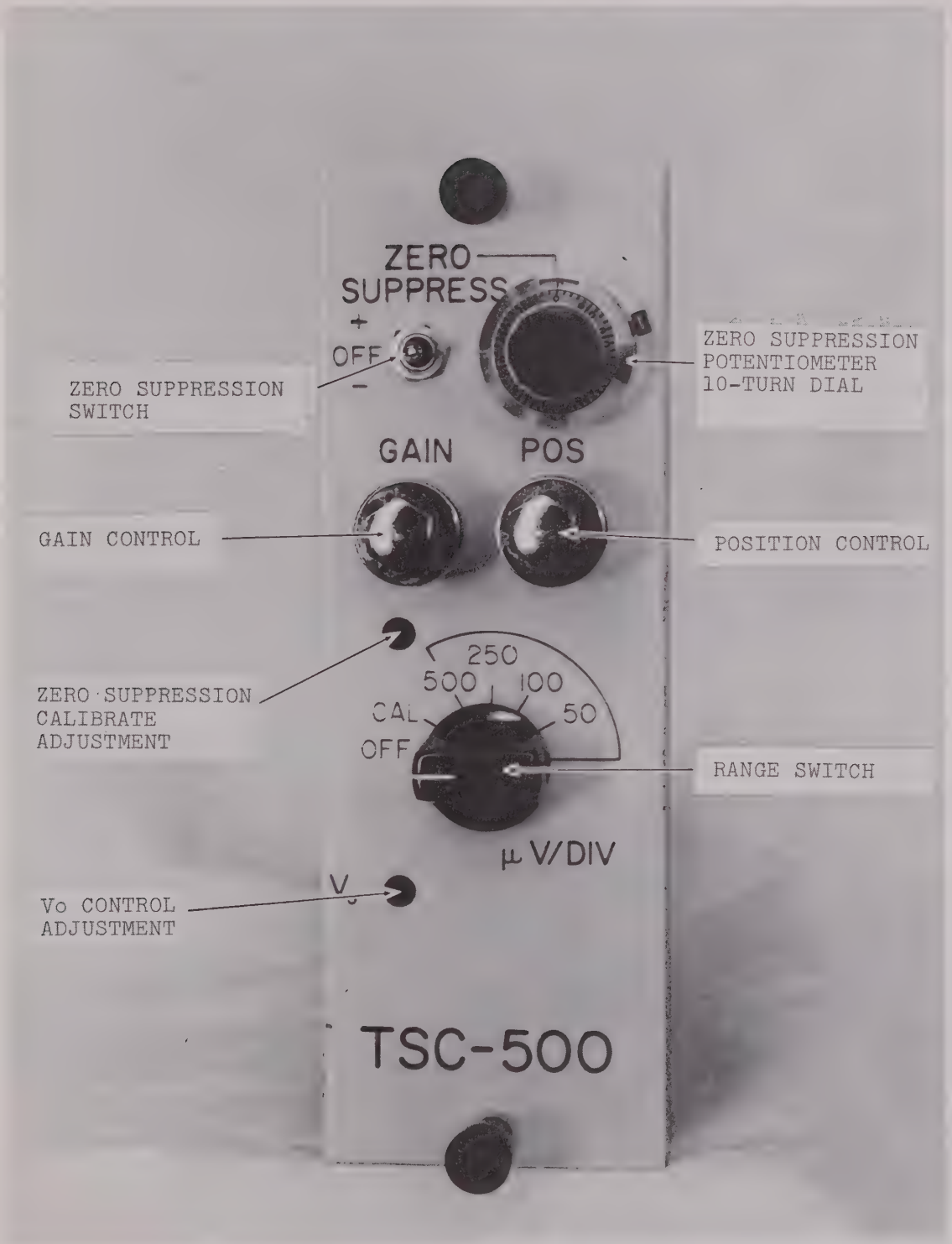
		Page
I.	Description of Equipment	I-1
II.	Installation	II-1
III.	Operation	III-1
IV.	Principles of Operation	IV-1
V.	Preventive Maintenance	V-1
VI.	Troubleshooting	VI-1
VII.	Parts List	VII-1
VIII.	Schematics	VIII-1

LIST OF ILLUSTRATIONS

	DWG. #
Assembly, High Gain Pre-Amp. Zero Suppression	401684
Schematic, Module and PC Board	600985
Component Layout	401680
Assembly, Range Switch	201771
Photo of Model TSC-500, Front Panel Controls	
Photo of Model TSC-500, Side View	
Photo of Model TSC-500 Signal Conditioner	



Model TSC-500 Signal Conditioner



Model TSC-500, Front Panel Controls

1. DESCRIPTION OF EQUIPMENT

A. Introduction

The TECHNI-RITE Model TSC-500 Signal Conditioner is a plug-in unit used with the TECHNI-RITE Model TR-888 Eight Channel Recorder for recording outputs in a high gain system with 50 uv/div sensitivity (up to 500 uv/div). This unit controls the input signal and stylus in the particular channel that it is used on the TR-888. The unit contains position, gain, range switch, V_o controls and ten times zero suppression.

The Model TSC-500 is one of a number of interchangeable signal conditioners that may be used with the TR-888 Recorder:

B. Specifications

The TSC-500 Specification follows:

Input Resistance & Configuration: 5 Megohm, single-ended, floating
Attenuator Positions: OFF, CAL, 500, 250, 100, and 50 uv/division
Maximum Calibrated Sensitivity: 50 uv/division
Stylus Position Control: Full scale
Calibration: Internal ± 1%
Noise on Recorded Trace: Max. 0.30 div. with 100 ohm source
Linearity (overall): ±½% full scale
Drift with Time: Typical 0.25 division per 8 hours
Operating Temperatures: 0 to 40° C Ambient
Signal Input Connector: On Recorder
Zero Suppression: ±½ div. (for input up to ±1.25 MV); 10 X Full Scale at any Range Switch setting. Accuracy: ±1% of Full Scale.
Front Panel Controls: Zero Suppression, Zero Suppression Switch, Gain, Position, Zero Adjustment, Range Switch and V_o Adjustment.

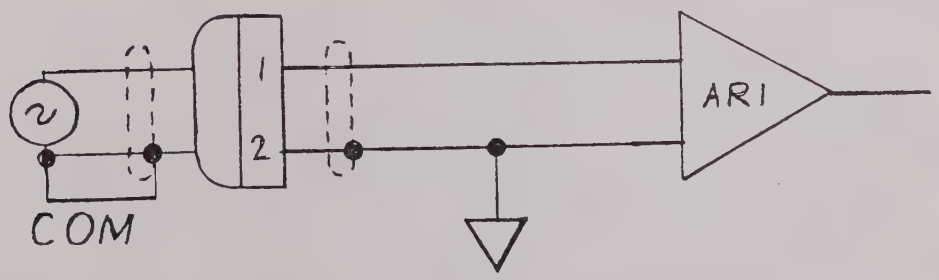
CAUTION: A MERCURY BATTERY IS USED IN THE ZERO SUPPRESS CIRCUITRY OF THIS SIGNAL CONDITIONER. THIS BATTERY HAS A SHELF LIFE OF 18 MONTHS AND A WORKING LIFE OF 75 WEEKS (BASED ON 40 HOUR WEEK) UNDER AVERAGE USE. WHEN THE TSC-500 SIGNAL CONDITIONER IS NOT IN USE, THE ZERO SUPPRESS SWITCH SHOULD BE IN THE OFF POSITION.

II. INSTALLATION

The TSC-500 slides into the two guides provided on the TR-888 recorder. Be sure that the module is properly in the slides or damage will result to the PC board. The module should be flush with the front of the recorder after installation. This is to ensure proper electrical connection between the PC board and the recorder.

A. Signal Wiring Connections

The TSC-500 is a sensitive signal conditioner in respect to its uv sensitivity and must be wired accordingly. Shielded cable should be used from the input connector to the desired source of signal input. The positive side of the signal should be connected to pin 1. The shield should be connected to the signal common at the signal source to prevent any noise from affecting the signal level. Connect the signal source common to a good earth ground, which will generally reduce 60 cycle noise pickup. The signal cable should be 4 to 6 feet in order to reduce noise pickup.



SIGNAL INPUT CONNECTIONS

III. OPERATION AND CALIBRATION*

A. Operation and Internal Calibration (in the following order)

1. Turn the main power switch (on the recorder) to the ON position; set the chart drive switch to 5 or 10 mm/sec.

2. Set the range switch on the signal conditioner control panel to OFF and the zero suppression switch to the OFF position. (See drawings 401684 and 600985).

3. Occasionally the stylus pressure should be checked to be sure it is between 2 and 4 grams. The stylus pressure gage is used for this purpose. Check paper tension occasionally (see recorder manual).*** Adjust the recorder trace width control for minimum readable trace width (0.1 div).

4. Unlock the shaft lock for the gain control by turning the knurled knob 1/2 turn CCW. Then turn gain control knob to fully CCW.

5. Unlock the shaft lock for the position control by turning the knurled knob 1/2 turn CCW. Check to be sure that the stylus limiter on the pen motor amplifier is set up properly. (see recorder manual.) Use the position control to set the stylus to the chart center for normal operation. Lock the position control by turning the knurled knob CW. (If only a positive signal is present, the stylus can be positioned to the left edge of the chart channel which would provide a full channel for recording. This left edge then becomes the new zero baseline.)

6. Turn the gain control fully CW. Adjust the V_o potentiometer to move the stylus to the chart zero baseline. This nulls out the offset voltage of the amplifierr. To move the stylus to the left, turn the V_o adjustment CCW. Turn the range switch to 50 uv position, and check the stylus position. If the stylus is not at the zero baseline readjust V_o (R41).

---

* Once Operation is set, normal operation needs no further calibration.

*** L-359A

7. Set the range switch to the CAL position. Carefully set the gain control and adjust for 20 division stylus deflection from its baseline and lock the gain control. There are 25 divisions to each side of the center "zero" line of the channel. Carefully lock the gain control with the shaft lock. To ensure the accuracy of the amplifier sensitivity, the calibration voltage should be checked periodically with a good voltage meter or by an external calibration check.

8. Set the range switch to OFF and be sure that the stylus returns precisely to the channel center line. Repeat steps 4, 5, 6 and 7 if necessary.

9. Step through the 50 to 500 uv/div positions and check for stylus position with the input shorted circuit. The stylus must not deviate more than 0.25 division from chart center on all ranges. The stylus deviation from the chart center is due to the I_o offset of the amplifier.

10. The channel is now calibrated and ready to accept a signal.

11. Check the system square wave response to be sure it gives 1 Hz square wave with 40 divisions peak-to-peak with 1 (±½) division overshoot.

B. Zero Suppression

Zero suppression is a calibrated 10-times full scale electrical position control at all settings of the range switch. The purpose of 10 X full scale zero suppression is to allow expanded scale recording of small AC signal components which are "riding" on top of a large DC component.

1. How to Use the 10X Zero Suppression

a. Record the signal to be investigated without using zero suppression. Note the approximate peak-to-peak amplitude of the AC signal component and the DC components. Instead of using chart paper, a calibrated oscilloscope may be used for this purpose.

b. Refer to the Zero Suppression Table that follows for suggested practical range switch settings for various combinations of DC and AC components.

c. If a positive DC component is to be suppressed, set the zero suppression switch to "+"; for a negative DC component, set the switch to "-".

d. Choose and record the type of "zero" (channel center or margin) which is to be used. Set this "zero" with the POS control with the range switch in the OFF position. DO NOT TOUCH POSITION CONTROL THEREAFTER, as all readings will be taken from this initial "zero".

ZERO SUPPRESSION TABLE

Range Switch Setting (uv/div)	Effective Full-Scale Sensitivity (Max.P-to-P AC Signal to be Recorded)	Zero Suppression Voltage For One Full Turn of Z.S. dial	Max. Z.S.Voltage (Max.DC Signal to be Suppressed)
50	2.5 mv	2.5 mv	25 mv
100	5.0 mv	5.0 mv	50 mv
250	12.5 mv	12.5 mv	125 mv
500	25.0 mv	25.0 mv	250 mv

Examples:

1. 1 mv peak-to-peak AC signal riding on +20 mv DC level:
   Set range switch to 50 uv/div position.
   Set zero suppression switch to "+" position.
   Set zero suppression dial to 8.0 turns (20 mv ÷ 2.5 mv/turn = 8.0 turns).
   Recorded AC signal amplitude = 20 divisions peak-to-peak.
2. 20 mv peak-to-peak AC signal riding on -225 mv level:
   Set range switch to 500 uv/div position.
   Set zero suppression switch to "-" position.
   Set zero suppression dial to 9.0 turns (225 mv ÷ 25 mv/turn = 9.0 turns).
   Recorded AC signal amplitude = 40 divisions peak-to-peak.

C. External Calibration

External calibration of the signal conditioner is required when there is a need for extreme accuracy and reliability on the part of the user. To perform the external calibration procedure:

1. Be sure that the TSC-500 has been completely through the internal calibration procedure (see A.) and that the stylus positioning is at center. With the TSC-500, which has a zero suppression feature, be sure that the suppression switch is on OFF before performing external calibration.

2. Acquire an external source DC supply capable of delivering ten millivolt ±1% accuracy. Use a digital voltmeter for monitoring this DC source.

3. Set the external source for +10 mv output.

4. Set the range switch on the signal conditioner at 500 uv/div which is the lowest sensitivity.

5. Insert +10 mv into the signal conditioner with the external source.

6. Adjust gain for 20 divisions.

7. Remove external source signal; the TSC-500 is now calibrated.

To ensure the accuracy of the TSC-500 signal conditioner, use external calibration periodically to check the internal calibration as follows:

After performing the external calibration procedure, turn the range switch to the CAL position. If the stylus deflects to 20 (±0.1) divisions to the right, this indicates that the TSC-500 is in good calibration. If the stylus is deviated from 20 (±0.1) divisions, this indicates that the signal conditioner is out of calibration. Check the internal calibration voltage of the signal conditioner which should be 10 mv (±1%).

In addition, to ensure the accuracy of the zero suppression circuit, the voltage across the 10-turn zero suppression should be checked periodically. It should read 250 millivolts.

IV. PRINCIPLES OF OPERATION

The Model TSC-500 conditions the input signal and controls the stylus in the particular channel that it is used in the TR-888 recorder. It has the added feature of zero suppression. Each TSC-500 (Drawings 401684 and 600985 consists of an operational amplifier, a power supply, a zero suppression circuit, and front panel controls.

A. Operational Amplifier

This is a precision integrated circuit operational amplifier with very high input impedance, low input current and very low offset voltage drift with temperature. The operational amplifier is operated as a non-inverting amplifier with feedback to provide stable operation. Capacitor C2 provides the frequency compensation for the operational amplifier to ensure stable operation; capacitor C1 improves the power supply noise rejection for the operational amplifier.

B. Power Supply

The power supply contains a bridge rectifier, filters, two series regulators, and zener diodes. It provides regulated voltage to the amplifier circuit (AR1) and power to the pen motor amplifier.

The bridge rectifier CR7 provides a DC output voltage to filter networks C3 and C4. The filtered voltage is applied to series regulators Q1 and Q2. CR5 and CR6 keep the base voltage at ±16 volts, respectively, on Q1 and Q2. Their outputs are fed to the pen motor position control, CR3 and CR4. R6 and R7 drop ±6 volts, respectively, on CR3 and CR4 which provide ±9 volts double regulated output to the amplifier circuit.

C. Zero Suppression Circuit

The zero suppression circuit provides a DC voltage up to 10X full scale in the directions opposite to DC components of the signal. The zero suppression voltage is provided from a battery which is completely isolated from the 60 cycle power line. This should completely eliminate the 60 cycle noise coming from the power line. The zero suppression switch provides a selection to suppress either the positive or negative DC component of the signal. If the DC signal to be suppressed is positive, turn the switch to "+". If the DC signal to be suppressed is negative, turn the switch to "-". When the zero suppression circuit is not in use, the zero suppression switch should be in the OFF position.

D. Front Panel Controls

The following front panel controls function in the manner described:

1. Gain Control (R18)

This potentiometer controls the output signal voltage of the signal conditioner to the pen motor amplifier. The output voltage is taken off the wiper of the gain potentiometer and fed to the pen motor amplifier. The gain control is normally locked after calibration to ensure the accuracy of the recorder.

2. Position Control (R19)

The integrated pen motor amplifier position input will cause the recorder stylus to deflect fully to the right when +15.5 VDC is applied and fully to the left when -15.5 VDC is applied. Accordingly, the position control potentiometer is connected across the power supply from +15.5 VDC to -15.5 VDC. The position control signal is taken off the wiper of the position control potentiometer, with respect to common, and is fed to the pen motor amplifier through an edge connector in the recorder.

3. Range Switch (S1) (Dwg. 201771)

This switch sets the gain of the operational amplifier, provides a means of calibration, and provides a zero volt to the amplifier without short circuiting the signal source in the OFF position. The range switch has six positions. The 50 to 500 uv/div positions are for selection of the desired sensitivity. The CAL position is for calibrating the recorder to 50 uv/divisions. In the OFF position, the signal source is electrically disconnected from the TSC-500, and the input of the signal conditioner is short circuited to provide a zero voltage signal.

4. V_o Control

The V_o control is a screwdriver adjustment to null out the offset voltage of the operational amplifier. The control should have a minimum of ±10 division adjustment at 50 uv/division sensitivity.

5. Zero Suppression Potentiometer

The zero suppression potentiometer is a 10-turn potentiometer which controls the amount of stylus offset generated by an external signal. A 10-turn dial, mounted on the front panel, provides an accurate calibrated zero suppression voltage indication. One complete turn of the zero suppression dial provides a zero suppression voltage equal to a full scale sensitivity of the amplifier at whatever the range switch setting.

6. Zero Suppression Switch

The zero suppression switch is a 3-position switch which provides a selection of positive or negative suppression voltage. If the DC signal to be suppressed is positive, turn the switch to "+". If the DC signal to be suppressed is negative, turn the swtich to "-". When the zero suppression circuit is not in use, the zero suppression switch should be in the OFF position.

7. Zero Suppression Calibrate Adjustment

The zero suppression calibrate adjustment (R16) is a potentiometer which is adjusted to compensate for decreasing battery voltage. The voltage across the 10-turn zero suppression should be checked periodically to be sure it reads 250 millivolts.

V. PREVENTIVE MAINTENANCE

A. Periodic Maintenance - Mechanical Check

These TSC checks are generally recommended every 500 hours of operation or every three to six months, as determined by experience. They may also be used for preliminary troubleshooting; but because of the mercury battery used in the zero suppression circuit, the battery and zero suppression voltage should be checked whenever the unit is being calibrated. See Section 1.B Specifications (Caution).

1. Preliminary

Turn OFF all power. Remove the preamplifier by grasping the top and bottom black knobs and then pulling the preamplifier straight out.

2. Cleaning

Blow out dust and dirt with an air hose. Inspect for foreign particles. Clean the preamplifier panel and knobs with a moist cloth, then wipe dry with a soft, dry cloth.

3. Inspect for Tightness

Inspect the preamplifier and power supply for loose transistors, plug-in components, resistors, condensers, controls, terminal boards, mounting boards, rectifiers, fuses, transformers, etc.. Check that all panel-mounted components are securely in place, that all locking controls will lock securely, and that each knob is tight on its shaft.

4. Inspect for Damage

Inspect visually and by smell for burned or worn insulation, leakage, or damaged resistors, condensers, transformers, etc. Inspect also for corrosion, rust, and electrical or mechanical abuse.

5. Replace

Reinstall the equipment and fasten securely.

VI. TROUBLESHOOTING

Symptoms	Check (See Dwg. 600985 & 401684.)
NO OUTPUT - NO POSITION	1. Channel Fuse 2. Board Connections 3. Power Supply a. CR7 output voltage approximately 43 VDC; if not, check C3 and C4. b. Emitter of Q1 to E14 +16 VDC; if not, check R8, CR5 and Q1. c. Emitter of Q2 to E14 -16 VDC; if not, check R9, CR6 and Q2. 4. Check R19. 5. Check R6, CR3, CR4, and R7. 6. If problem remains, check amplifier circuitry for shorts and then check the recorder. 7. Make sure the pen motor amplifier & transformer function properly for this particular channel.
WITH POSITION BUT NO OUTPUT	1. E6 to E14; if no signal, check CR1 and CR2. 2. E7 to E14; if no signal, check R5 and AR1. 3. Check CR3 and CR4, R6 and R7. 4. E8 to E14; if no signal, check R18.
WITH OUTPUT BUT NO POSITION	1. Check R19 for open. 2. Check Q1 and Q2 output.
WITH OUTPUT AND POSITION, NOISE ON LEFT SIDE	1. Emitter of Q2 to E14 with oscilloscope for AC ripple. 2. Check C4, CR6 and CR4.
WITH OUTPUT AND POSITION, NOISE ON RIGHT SIDE	1. Emitter of Q1 to E14 with oscilloscope for AC ripple. 2. Input clamps CR1 and CR2.
UNABLE TO CALIBRATE	Check R10, R11, R12.
10X ZERO SUPPRESSION CIRCUIT NOT FUNCTIONING	1. Check battery. 2. Check wiring of zero suppression circuit.

VII. PARTS LIST

Parts lists are compiled by assembly or subassembly. They are listed first by reference designation in alphanumeric order and then alphabetically by nomenclature. To the right of each nomenclature or part name is the manufacturer (Techni-Rite or otherwise), manufacturer's part number, and then TECHNI-RITE part number which every part has. Manufacturer's part name and number are given in the PARTS LIST when available. However, it is sometimes more expedient and less expensive to obtain the part locally. Sometimes a part (such as a resistor, where its value is known) may even be available in the customer's own stock of supplies.

L-391

Ref. Desig.	Dwg. 401684 Description	Techni-Rite Part No.	Mfr.	Mfr. P/N	Units per Ass'y
1	Knob, Module	104705	-	-	2
2	Plug, Banana	104707	-	-	2
3	Front Panel	B-401095	-	-	1
4	Multidial	101955	-	-	1
5	Nut, decorative	103758	-	-	1
6	Knob	102023	-	-	2
7	Shaft Lock	102024	-	-	2
8	Knob	103575	-	-	1
9	Attenuator, Ass'y	201771	-	-	1
10	Nut, Hex	#4-40	-	-	4
11	Loctite Brg Ser Kit	#113	-	-	2
12	Washer, Nylon	104706	-	-	2
13	Switch, Toggle DPDT	106015	-	-	1
14	Potentiometer, 100 ohms	101954-101	**	**	1
15	Potentiometer 20 K	102008-203	CTS-Berne,Inc.	T-200	2
16,17	(No part)	-	-	-	-
18	Strap	104681	-	-	1
19	Layout component		-	-	1
20	Schematic		-	-	1
21	Screw, Phil, Rd. Hd.	#4-40 X ¼	-	-	3
22	Screw, Phil, Rd. Hd.	#4-40 X 3/8	-	-	1
23	Screw, Phil, Fl. Hd.	#4-40 X ¼	-	-	3
24	Washer, Lock	#4-40	-	-	4

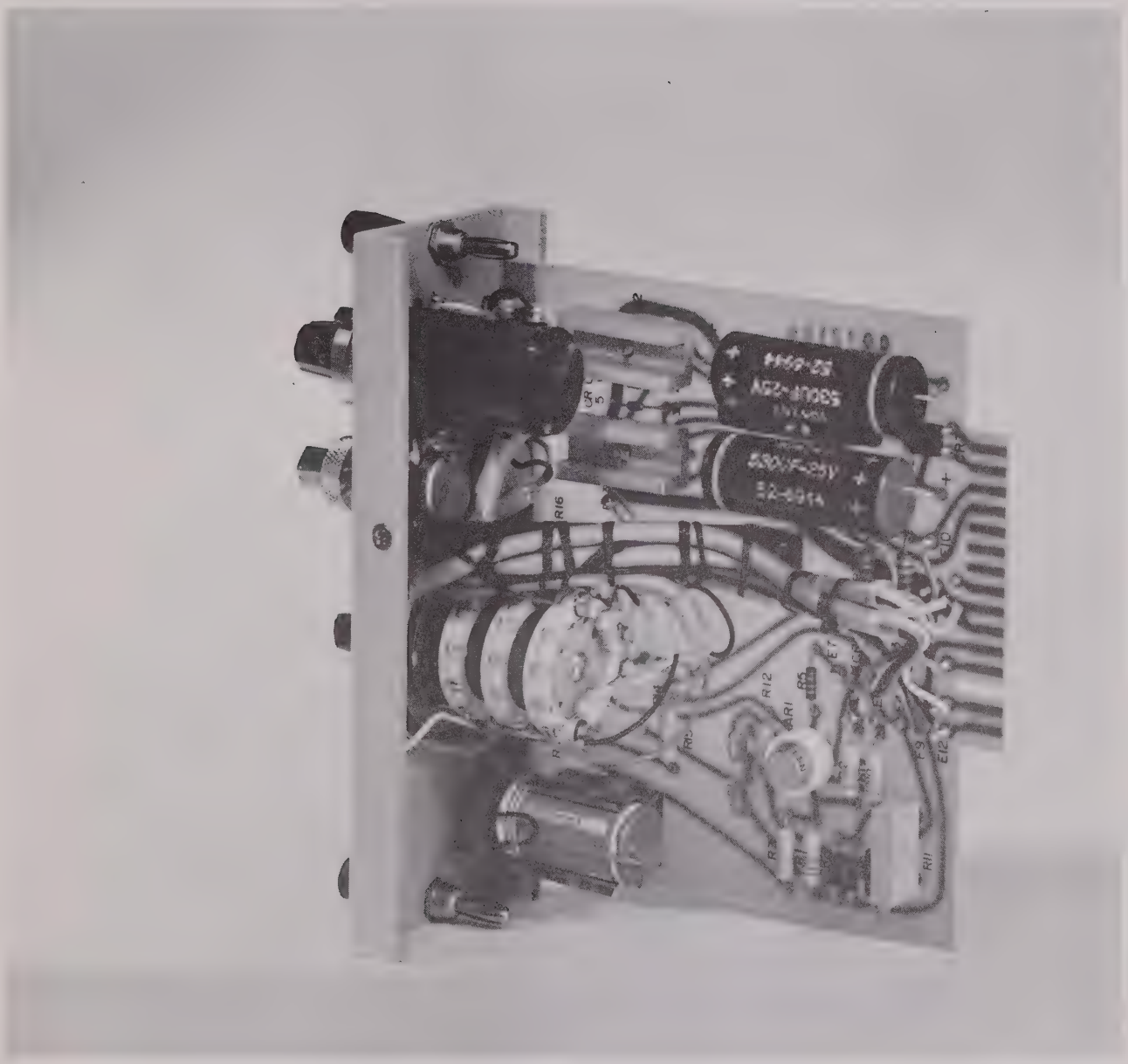
Ref. Desig.	Dwg. 201771 Description	Techni-Rite Part No.	Mfr.	Mfr. P/N	Units per Ass'y
R101	Resistor 2K ¼W MF 1%	100549-2001	*	-	1
R102	Resistor 6.04K ¼W MF 1%	100549-6041	*	-	1
R103	Resistor 10K ½W MF 1%	100549-1002	*	-	1
R104	Resistor 909 ohms	100549-909R	*	-	1
R105	Resistor 1.0 K	100549-1001	*	-	1
R106	Resistor 3.01 K	100549-3011	*	-	1
R107	Resistor 4.99 K	100549-4991	*	-	1
S1	Rotary Switch	104951-3	CTS-IRC	(Stk T221/ Type 212)	1

* See your local dealer.
** Fairchild Control P/N MF78 Series, or, Amphenol P/N 2151B.

Ref. Desig.	Dwg. 401680 Description	Techni-Rite Part No.	Mfr.	Mfr. P/N	Units per Ass'y
AR1	Operational Amp	106540	Nat'l Semi.	LM308	1
C1	Capacitor 1000PF	100484-102	Sprague	5GA-D10	1
C2	Capacitor 200 PF	100484-201	Sprague	5GA-T20	1
C3,C4	Capacitor 530 uf 25V	104747			2
CR1,CR2	Diode Signal	1-101971	G.E.	IN547	2
CR3,CR4	Diode 9V	101968-9	Motorola	IN4739A	2
CR5,CR6	Diode 16V	101968-16	Motorola	IN4745A	2
CR7	Rectifier	106080-2	Motorola	MDA920A-X	1
Q1	Transistor	103833	Motorola	2N4922	1
Q2	Transistor	103846	Motorola	2N4919	1
R1,R13	Resistor 100 ohms ¼W MF	100549-100R	*	-	2
R2	Resistor 1.91K ¼W, MF	100549-1911	*	-	1
R3	Resistor 124K ¼W, MF	100549-1243	*	-	1
R4,R16	Potentiometer 20K	103954-203	Beckman Heli.	77PR	2
R5	Resistor 500 ohms ¼W cc	100556-511	*	-	1
R6,R7	Resistor 330 ohms ¼W cc	100557-331	*	-	2
R8,R9	Resistor 150 ohms 1W cc	100558-151	*	-	2
R10	Resistor 887 ohms ¼W MF	100549-887R	*	-	1
R11	Potentiometer 500 ohms	103954-501	Beckman Heli.	77PR	1
R12	Resistor 1 MEG ¼W, MF	100549-1004	*	-	1
R14,R15	Resistor 20K ¼W, MF	100549-2002	*	-	
HS1,HS2	Heat Sink	104613-2	Edgecomb Stl	6063-T5	2
	Pad, Transistor	104305	Thermalloy	-	1
	Printed Circuit Board	106541	-	-	1
	Clip Component	102370	Augat	6-16-16AN	1
	Battery, Mercury	102118	Mallory	TR132RT2	1

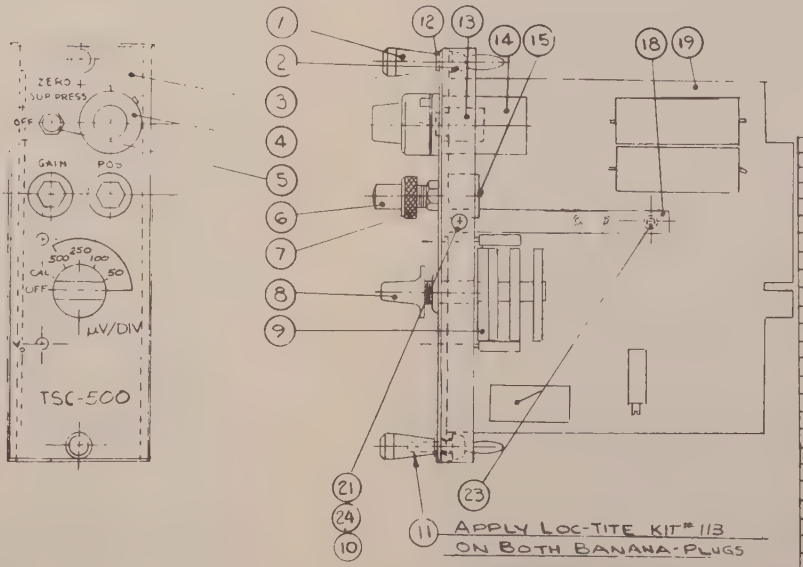
* See your local dealer.

VIII. SCHEMATICS



Model TSC-500, Side View

REVISIONS				
ZONE	LTR	DESCRIPTION	DATE	APPROVED
	A	RELEASED	6/17/70	J. C.
	B	FIND# 13 WAS 103515 ROTARY SWITCH	6/25/70	21868



NOTES:
1. MODULE TO BE ALIGNED IN FIXTURE FOR PROPER FIT IN RECORDER
2. THIS DWG WAS ORIGINATED FROM P/N 401537

QUAN REQ	FIND NO.	PART NO. OR IDENTIFYING NO.	NOMENCLATURE OR DESCRIPTION
4	24	#4-40	LOCK WASHER
3	23	#4-40 x 1/4	RD. HD. SCREW - PHILLIPS
2	22	#4-40 x 3/8	RD. HD SCREW - PHILLIPS
3	21	#4-40 x 1/4	FL HD SCREW - PHILLIPS
X	20	600885	SCHEMATIC (MODULE)
1	19	401680	COMPONENT LAYOUT (TSC-500)
1	18	104681	STRAP
	17		
	16		
2	15	102003-03	POTENTIOMETER
1	14	101954-10	POTENTIOMETER 100 Ω
1	13	106015	DPDT TOGGLE SWITCH
2	12	104706	NYLON WASHER
X	11	SCREW LOCK	LOCTITE BRG SEV KIT # 113
2	10	#4-40	HEX-NUT
1	9	301771	ASSEM. ATTEN.
1	8	103575	KNOB
2	7	102024	SHAFT LOCK
2	6	102023	KNOB
1	5	103758	DECORATIVE NUT
1	4	101955	MULTIDIAL
1	3	3-1-401095	FRONT PANEL
2	2	104707	BANANA PLUG
2	1	104705	KNOB-MODULE

DWG SIZE | CODE IDENT | SPECIFICATIONS

PARTS LIST

UNLESS OTHERWISE SPECIFIED
DIMENSIONS ARE IN INCHES.
TOLERANCES ON:
FRACTIONS ± 1/64 | TWO PLACE DECIMALS ± .010
ANGLES ± 1° | THREE PLACE DECIMALS ± .005
REMOVE ALL BURRS AND SHARP EDGES. DIMENSIONS AND TOLERANCES SHALL BE HELD AFTER PLATING. 63 MACHINE SURFACES TO BE √ RMS.
MATERIAL

DRAWN BY: JOHN F. CAYER 16 JUN 70 DATE
CHECKED BY: W.R GARIEPY 16 JUN 70
CONTRACTOR CERTIFICATION:
DESIGN APPROVAL:
DOCUMENTATION APPROVAL:

Gulton technirite ELECTRONICS INCORPORATED

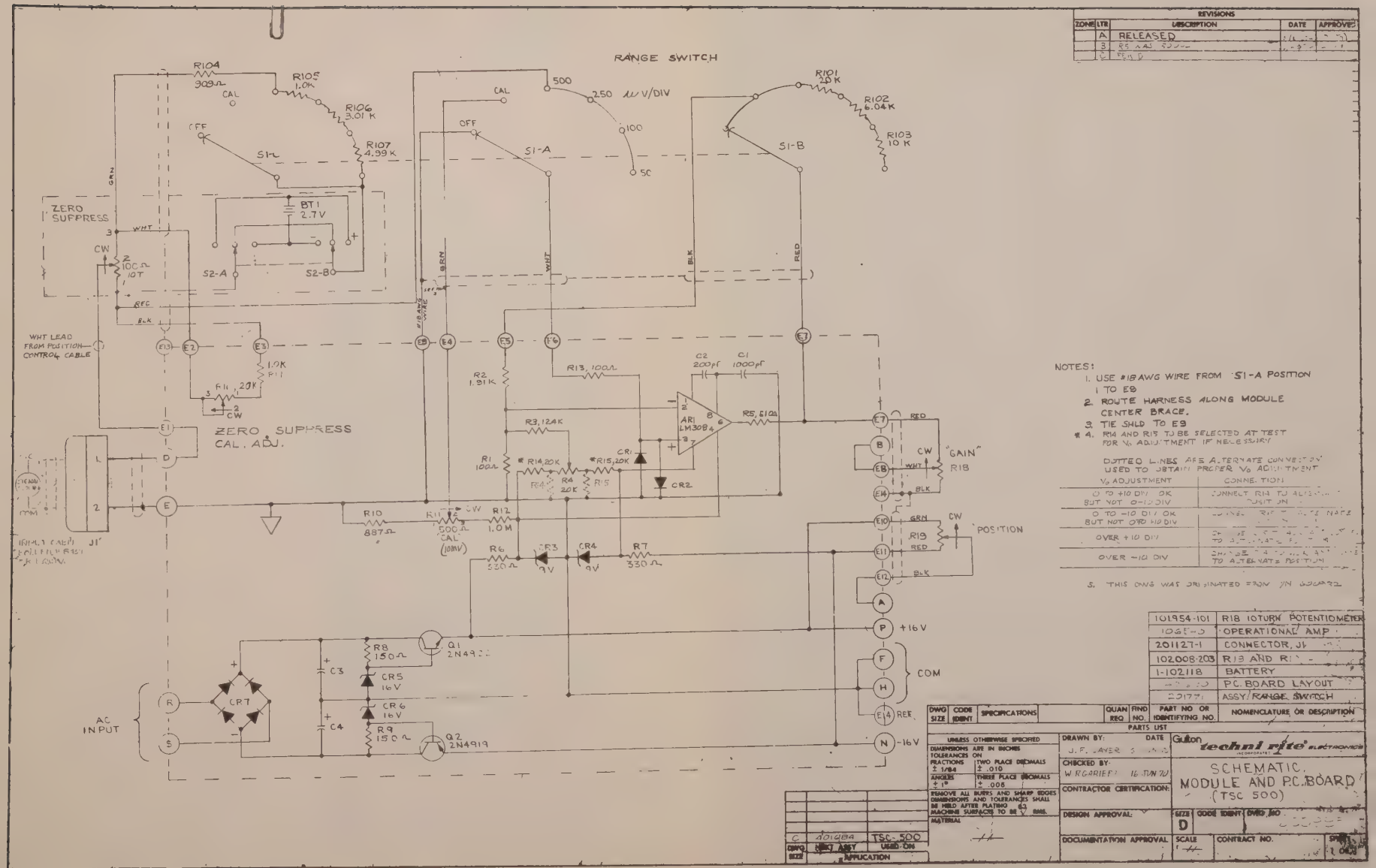
ASSEMBLY,
HIGH GAIN PRE-AMP/ZERO SUPP
TSC-500

SIZE	CODE IDENT	DWG NO.
C		401684

SCALE	CONTRACT NO.	SHEET
1/1		1 OF 1

E	800066	TR 888

DWG SIZE | NEXT ASSY | USED ON
APPLICATION



REVISIONS			
ZONE	LTR	DESCRIPTION	DATE	APPROVED
	A	RELEASED		
	B	R5 WAS 500Ω		
	C	PER P		

NOTES:
1. USE #18 AWG WIRE FROM S1-A POSITION 1 TO E9
2. ROUTE HARNESS ALONG MODULE CENTER BRACE.
3. TIE SHLD TO E9
* 4. R14 AND R15 TO BE SELECTED AT TEST FOR V_o ADJUSTMENT IF NECESSARY

DOTTED LINES ARE ALTERNATE CONNECTION USED TO OBTAIN PROPER V_o ADJUSTMENT

V_o ADJUSTMENT	CONNECTION
0 TO +10 DIV OK BUT NOT 0-10 DIV	CONNECT R14 TO ALTERNATE POSITION
0 TO -10 DIV OK BUT NOT 0 TO 10 DIV	CONNECT R15 TO ALTERNATE POSITION
OVER +10 DIV	CHANGE R14 TO 40K AND CONNECT TO ALTERNATE POSITION
OVER -10 DIV	CHANGE R15 TO 40K AND CONNECT TO ALTERNATE POSITION

5. THIS DWG WAS DRIGINATED FROM DWG 201172

101954-101	R18 10TURN POTENTIOMETER
10[illegible]	OPERATIONAL AMP
20112[illegible]-1	CONNECTOR, J1
102008-203	R19 AND R[illegible]
1-102118	BATTERY
[illegible]	P.C. BOARD LAYOUT
201171	ASSY/RANGE SWITCH

DWG SIZE	CODE IDENT	SPECIFICATIONS	QUAN REQ	FIND NO.	PART NO. OR IDENTIFYING NO.	NOMENCLATURE OR DESCRIPTION
PARTS LIST						

UNLESS OTHERWISE SPECIFIED
DIMENSIONS ARE IN INCHES
TOLERANCES ON FRACTIONS ± 1/64
TWO PLACE DECIMALS ± .010
ANGLES ± 1°
THREE PLACE DECIMALS ± .005
REMOVE ALL BURRS AND SHARP EDGES
DIMENSIONS AND TOLERANCES SHALL BE HELD AFTER PLATING
MACHINE SURFACES TO BE 63 RMS.
MATERIAL

DRAWN BY: J. F. LAYER 15 JAN 70
CHECKED BY: W. R. GARNER 16 JAN 70
CONTRACTOR CERTIFICATION:
DESIGN APPROVAL:
DOCUMENTATION APPROVAL

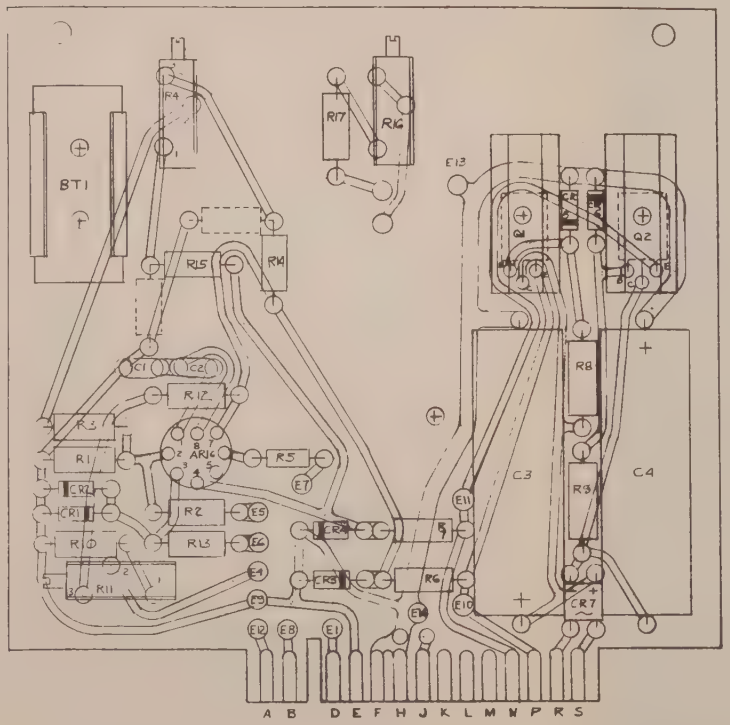
Gulton technilite ELECTRONICS INCORPORATED

SCHEMATIC, MODULE AND P.C. BOARD (TSC 500)

SIZE D | CODE IDENT | DWG NO.
SCALE | CONTRACT NO.

DWG SIZE	NEXT ASSY	USED ON
C	201184	TSC-500
	APPLICATION	

REVISIONS				
ZONE	LTR	DESCRIPTION	DATE	APPROVED
	A	RELEASED	6/17/70	J.F.
	B	FIND #14 WAS 500Ω	6/29/70	20381



NOTE:
THIS DWG WAS ORIGINATED FROM P/N A01539

		28		
	1	28	102370	COMPONENT CLIP
BT1	1	27	1-102118	BATTERY ASSY
R17	1	26	100549-1001	RESISTOR ¼W MF 1K
	X	25	600885	SCHEMATIC
	1	24	104306	PAD, TRANSISTOR
HS1, HS2	2	23	104613-2	HEAT SINK
Q2	1	22	103846	TRANSISTOR 2N4919
Q1	1	21	103833	TRANSISTOR 2N4922
R14, R15	2	20	100549-2002	RESISTOR ¼W MF 20K
R12	1	19	100548-1004	RESISTOR ¼W MF 1.0 MEG
R11	1	18	103954-501	POTENTIOMETER 500Ω
R10	1	17	100549-887R	¼W MF 887Ω
R8, R9	2	16	100558-151	1W CC 150Ω
R6, R7	2	15	100557-331	½W CC 330Ω
R5	1	14	100556-511	RESISTOR ½W CC 510Ω
R4, R16	2	13	103954-203	POTENTIOMETER 20K
R3	1	12	100548-1243	124K
R2	1	11	100548-1911	1.91K
R1, R13	2	10	100549-100R	RESISTOR ¼W MF 100Ω
CR7	1	9	106080-2	RECTIFIER
CR5, CR6	2	8	101968-16	16V
CR3, CR4	2	7	101968-9	9V
CR1, CR2	2	6	1-101971	DIODE SIGNAL 1N457
C3, C4	2	5	104747	530uf, 25V
C2	1	4	100484-201	200pf
C1	1	3	100484-102	CAPACITOR 1000pf
AR1	1	2	106540	OPP AMPL LM308
	1	1	106541	PRINTED CIRCUIT BOARD

SIZE	CODE IDENT	SPECIFICATIONS	QUAN REQ	FIND NO.	PART NO. OR IDENTIFYING NO.	NOMENCLATURE OR DESCRIPTION

PARTS LIST

UNLESS OTHERWISE SPECIFIED
DIMENSIONS ARE IN INCHES
TOLERANCES ON:
FRACTIONS ± 1/64
TWO PLACE DECIMALS ± .010
ANGLES ± 1°
THREE PLACE DECIMALS ± .005
REMOVE ALL BURRS AND SHARP EDGES. DIMENSIONS AND TOLERANCES SHALL BE HELD AFTER PLATING. DO MACHINE SURFACES TO BE 63 RMS.
MATERIAL

DRAWN BY: J.F. CAYER DATE 15 JUN 70
CHECKED BY: W. R. GARLERY 16 JUN 70
CONTRACTOR CERTIFICATION:
DESIGN APPROVAL:
DOCUMENTATION APPROVAL:

Gulton technl-rite® ELECTRONICS INCORPORATED

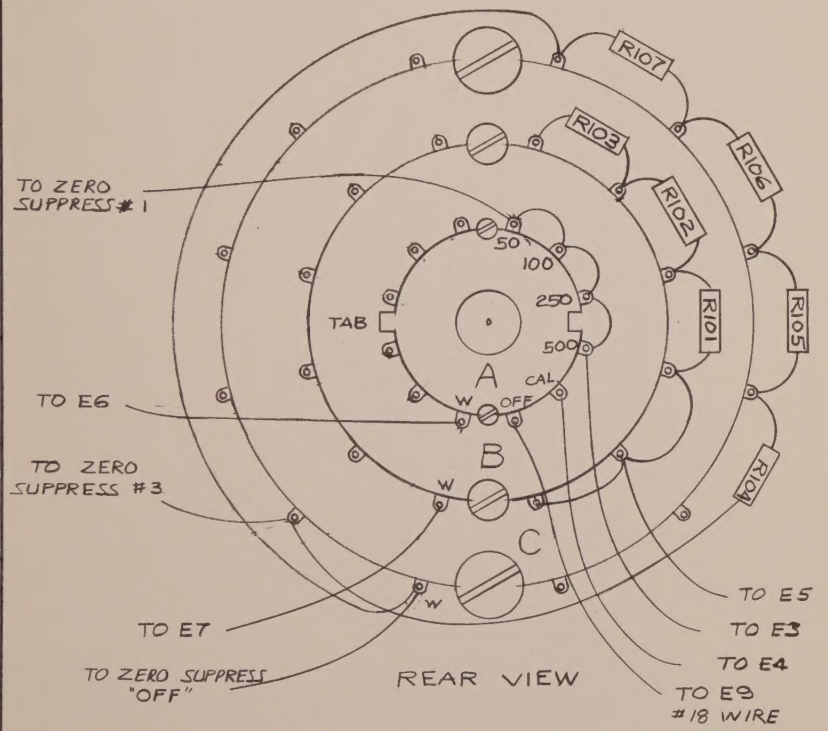
COMPONENT LAYOUT TSC-500

SIZE	CODE IDENT	DWG NO.
C		401680

SCALE | CONTRACT NO. | SHEET

C	401684	TSC-500
DWG	NEXT ASSY	USED ON

ZONE	SYM	DESCRIPTION	DATE	APPROVED
	A	RELEASED	6/17/70	J.F.
	B	PER DCR	7-15-70	22377



NOTE:
THIS DWG WAS ORIGINATED FROM P/N 201577

REFERENCE DESIGNATION	QUAN REQ	FIND NO.	PART NO	DESCRIPTION
R107	1	8	100549-4991	4.99 K
R106	1	7	100549-3011	3.01 K
R105	1	6	100549-1001	1.0 K
R104	1	5	100549-909R	909 Ω
R103	1	4	100549-1002	10 K
R102	1	3	100549-6041	6.04 K
R101	1	2	100549-2001	RESISTOR ¼WMF 1% 2 K
S1	1	1	104951-3	ROTARY SWITCH

PARTS LIST

UNLESS OTHERWISE SPECIFIED
DIMENSIONS ARE IN INCHES:
TOLERANCES ON:
FRACTIONS ± 1/64 | DECIMALS ±.005 | ANGLES ± 1°
REMOVE ALL BURRS AND SHARP EDGES.
DIMENSIONS AND TOLERANCES SHALL BE HELD AFTER PLATING.

DRAWN BY: 16 JUN 70 J.F CAYER
CHECKED BY: 16 JUN 70 W.R GARIEPY
CONTRACTOR APPROVAL:
DESIGN APPROVAL:
DOCUMENTATION APPROVAL:

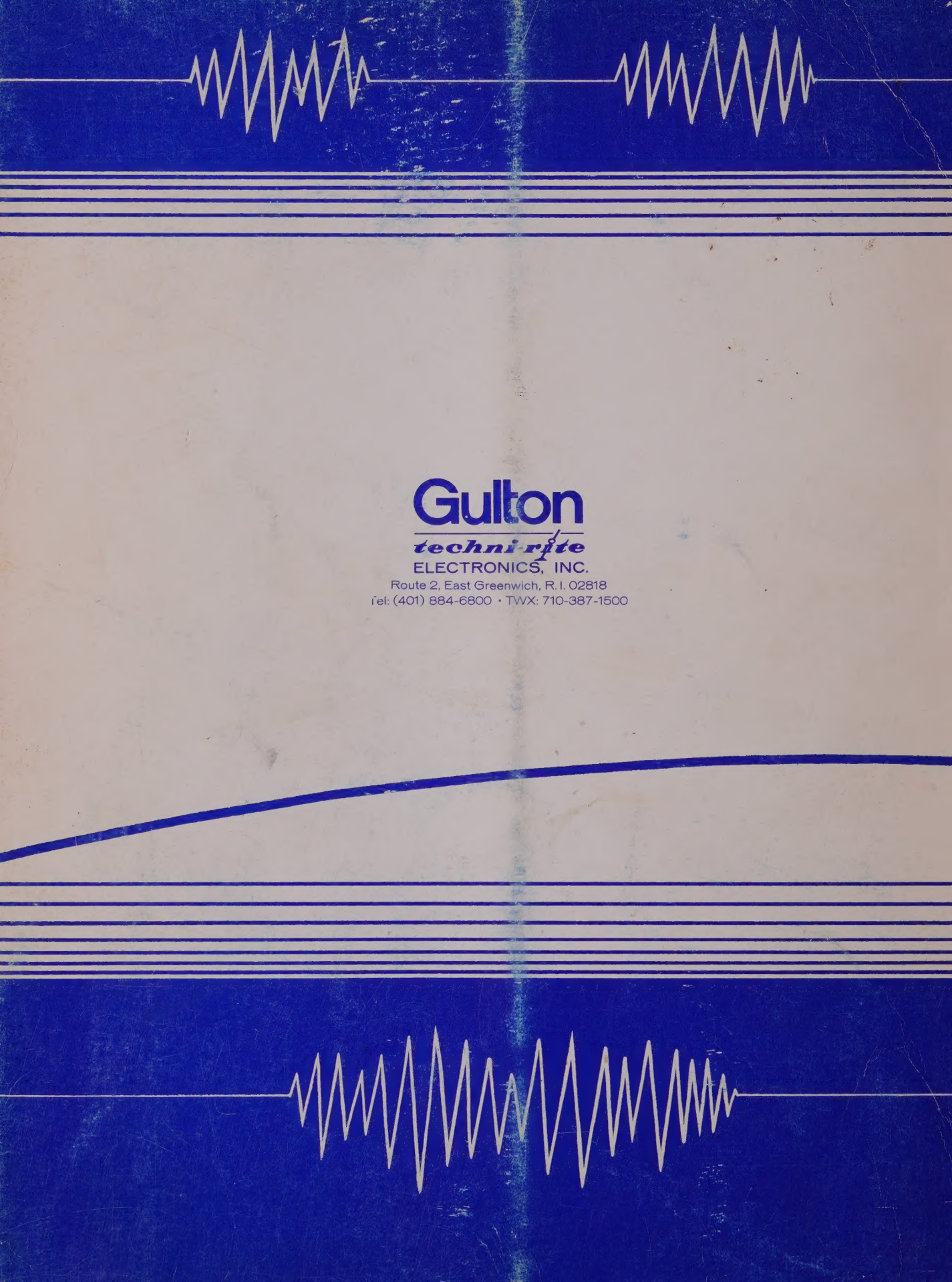
Gulton techni-rite® INCORPORATED ELECTRONICS

ASSEMBLY, RANGE SWITCH

NEXT ASSEMBLY	USED ON
401684	TSC-500
APPLICATION	

MATERIAL:

SIZE B | CODE IDENT NO. | DWG. NO. 201771
SCALE: NONE | CONTRACT NO. | SHEET 1 OF 1



Gulton

techni-rite

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